BUILDING STRUCTURE DESIGN OF THE SUNAN HOTEL 7 (SEVEN) FLOORS AND 1 (ONE) BASEMENT USING INTERMEDIATE MOMENT RESISTING FRAME (IMRF) IN SURAKARTA

Final Project

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Civil Engineering Bachelor Degree Requirement

submitted by :

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Surakarta, September , 2017

That state,

(M.Bagus Rizal Riyanansyah)

MOTTO

Verily, along with every hardship is relief. Along with every hardship is relief
(Q.S. Al-Insyirah : 6-7)

Learn from yesterday, life for today, hope for tomorrow
(Albert Enstein)

The best way to predict your future is to create it
(Abraham Lincoln)

INSCRIPTION

- *For my beloved family, Father, Mother, Brother and Sister. Thank you for all the prayers, guidance, valuable lessons, and affection that has been bestowed upon me and has given spirit until the completion of this Final Project*
- *Large families in Cirebon and Blitar, thanks for their prayers and support.*
- *Religion of Islam, Nation, State, Universitas Muhammadiyah Surakarta and Almamater and all those who have helped and supported me.*

PREFACE

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The authors are aware that the preparation of this Final Report is still far from perfect, Therefore all the correction and suggestions that are constructive The developer hopes for the completion of this Final Project. Great Hope Composer hope This Final Assignment is useful for Compilers and Readers.

Surakarta, September 2017

Author

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LIST OF NOTES

A_{cp} = The area bounded by the edge of the cross-sectional area (including hole), mm^2.

A_0 = The extent bounded by the central line wall pipe, mm^2.

A_{0h} = Restricted area begel outermost line, mm^2.

A_s = Area of longitudinal reinforcement tension (beam), mm^2.
= Area main reinforcement (slabs), mm^2.

A'_s = Area of longitudinal reinforcement compression (beam), mm^2.

A_{sb} = Divided reinforcement area (slabs), mm^2.

A_{st} = $A_s + A'_s$ = Total area of lngitudinal reinforcement (beam), mm^2.

$A_{s,b}$ = Tension reinforcement area on balanced condition (*balance*), mm^2.

$A_{s,maks}$ = The maximum limit area tension reinforcement on the concrete, mm^2.

$A_{s,min}$ = The manimum limit area tension reinforcement on the concrete, mm^2.

$A_{s,u}$ = Area of reinforcement necessary, mm^2.

$A_{v,u}$ = Area of shear reinforcement necessary, mm^2.

a = Hight block stress compression equivalent square block compression, mm.

a_b = Hight block stress compression equivalent square block compression condition belance, mm.

b = Wide beam, mm.

C_d = Deflection amplification factor

C_u = The upper limit coefficient of the period of vibration of the structure

C_c = Compression force concrete, N.

C_i = Coefficient of the slabs moment in the direction of the direction -i.

C_{lx} = Coefficient of plate field moment in the direction of the direction-x (short span).

C_{ly} = Coefficient of plate field moment in the direction of the direction-y (long span).

C_{tx} = Coefficient of plate field moment in the direction of the direction-x (short span).

C_{ty} = Coefficient of plate field moment in the direction of the direction-y (long span).

C_{rs} = Risk coefficient mapped short acceleration response period

C_{r1} = Risk coefficient mapped long term acceleration response

D = Dead load, N, N/mm, or Nmm.

= Symbol of reinforcement *deform* (threaded rebars).

d = The distance between the center of the tesion reinforcement and the edge of the concrete compression fiber, mm.

d_b = Reinforcement diameter, mm.

d_d = The distance between the center of tensile reinforcement on the innermost row and the ege fiber concrete compression, mm.

d'_d = The distance between the center of compression reinforcement on the innermost row and the ege fiber concrete compression, mm.

d_s = The distance between the center of the tension reinforcement and the concrete edge of the tension fiber, mm.

d_{s1} = The distance between the center of the first tension reinforcement weight and the edge of the concrete fiber tension, mm.

d_{s2} = The distance between the center of the first and second line tensiom reinforcement weights, mm.

d'_s = The distance between the center of the reinforcement compression and the edge of the concrete fiber compression, mm.

E = The load caused by the earthquake (*eartquake load*), N ar Nmm.

E_c = Modulus of elasticity of concrete, MPa.

E_s = Modulus of elasticity of stell, MPa.

f_{ct} = Concrete tension strength, MPa.

f'_c = Compressive strength of concrete and concrete quality required on concrete age 28 day, MPa.

F_a = Coefficient of acceleration site short period.

F_v = Site acceleration coefficient of 1 second.

f_y = Longitudinal reinforcement yield strength steel, MPa.

f_{yt} = Transverse reinforcement steel yield strength, MPa.

h = Height cross section of the structure, mm.

I = Moment of inertia, mm^4.

K = Factor moment, MPa.

K_{max} = Maximum moment factor, MPa.

L = Live load (*life load*), N, N/mm, or Nmm.

M_i = Moment plate in the direction of the direction -I, Nmm.

M_n = Actual nominal moment of structure, Nmm.

$M_{n,max}$ = Maximum nominal moment of maximum structure, Nmm

M_{lx} = Moment midlle of plates in the direction of the direction -x (short span), Nmm.

M_{ly} = Moment midlle of plates in the direction of the direction -y (long span), Nmm.

M_{tx} = Moment midlle of plates in the direction of the direction -x (short span), Nmm.

M_{ty} = Moment midlle of plates in the direction of the direction -y (long span), Nmm.

M_U = Necessary moments or moments factor, Nmm.

M_r = Moment of the structure plan, Nmm.

m = Maximum number of reinforcements 1 line beam wide.

N = Standard penetration test

n = The total number of reinforcement bars on the beam count.
= The number of feet shear reinforcement on the count shear reinforcement.

P_{cp} = Circumference bounded by the edge of the cross-sectional area (including hole), mm.

P_h = The circumference of which is bounded by the outermost line of the outer layer, mm.

q_D = Dead load distribution, N/mm.

q_L = Live load distribution, N/mm.

q_u = Load factor distribution, N/mm.

r = Inertial radius, mm.

S_{DS} = Short period acceleration response parameters

S_{D1} = Acceleration response parameter of 1 second period

S = Distance 1 meter or 1000 mm.

s = space shear reinforcement or space slabs reinforcement, mm.

T_n = Moment torque n nominal, Nmm.

T_u = Moment torque necessary or torsion torque , Nmm.

U = Strenght necessary or load factor, N, N/mm, or Nmm.

V_c = shear forces that can be retained by concrete, N.

V_n = nominal shear forces in reinforcement concrete structures, N.

V_s = shear forces that can be retained by the reinforcement, N.

V_u = necessary shear force or shear force force, N.

V_{ud} = the shear force at the distance d from the face of the pedestal, N.

α = the location of the reinforcement.

β = reinforcement coating factor.

β_1 = the equivalent square type stress concrete factor
depending on the quality of the concrete.

γ = reinforcement factor.

γ_c = Specific gravity concrete, kN/m^3.

γ_t = Weight soil on the foundation, kN/m^3.

λ = lightweight aggregate load factor.
= long span, m.

λ_d = length of tensile or tensile stress distribution, mm.

λ_{db} = length of basic stress distribution, mm.

λ_{dh} = length of hook reinforcement, mm.

λ_{hb} = length of hook distribution base, mm.

λ_n = clean span of columns or beams, m.

ϕ = symbol of plain reinforcement dimension, mm.
= strength reduction factor.

ρ = redundancy factor

Ω_0 = Stronger factor over structure

δ = Drift story

BUILDING STRUCTURE DESIGN OF THE SUNAN HOTEL 7 (SEVEN) FLOORS AND 1 (ONE) BASEMENT USING INTERMEDIATE MOMENT RESISTING FRAME (IMRF) IN SURAKARTA

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ABSTRACTION

Surakarta city located on the southern island of Java, Central Java Province, Indonesia. Surakarta city become tourist attraction for foreign and national to visit. These conditions will grow especially on the perspective of business. Infrastructure needs in the city of Surakarta will increase the coming of the tourists or people who have a purpose in coming different. The supporting infrastructure like as the construction site hotel. Therefore it, would planned building structure design of The Sunan hotel 7 (seven) floors and 1 (one) basement using intermediate moment resisting frame (IMRF) in Surakarta.Which should be considered in the planning of the building structure including safety aspects, architectural and economic. Planning the hotels building refers to the regulation standards (SNI) version that has been published, namely SNI-1726:2012 (Tata Cara Perencanaan Ketahanan Gempa Untuk Struktur Gedung dan Non-Gedung) and SNI 2847:2013 (Persyaratan Beton Struktural Untuk Bangunan Gedung). The building plan includes a main structure (the structure of columns, beams, and under the structure) and the steel roof structure and a slab structure (slab floors, staircases and basement). The location of the building in the city of Solo and the ground site including SD classification (ground medium), then the S_{DS} and S_{D1} values obtained are 0,599g and 0,370g. For planning of earthquake loads on the building needs sway intermediate (SI), used primacy building factor 1 (for building hotel are included in category II), response modification factor (R) equal to 5, the method of analysis earthquake load using the static equivalent. Quality of concrete used f'c 25 MPa, and the quality of reinforcement use fy 390 MPa and for shear reinforcement use fy 240 MPa. Dimensional beam structure planned 500/700 mm for the 1st to 4th floors, and 450/600 mm for the 5th floor to the roof. As for the column is planned with the dimensions 750/850 mm to all the floors. Under the structure of pile foundation planned diameter to use 400 mm with a depth total is 18 m, and dimensions of pile cap first type is 1500x1500x750 mm for pile foundation 5 piles, the second type is 3200x3200x750 mm for pile foundation 9 piles and the third type is 3200x2100x750 mm for pile foundation 9 piles. Sloof planned dimension 350/700 mm.

Keywords: *building structure, intermediate moment resisting frame, planning.*